

IN THE CLAIMS:

Amend Claims 1-21 and 23-31 as follows and add Claims 34-40:

1. (Currently Amended) A device for modular construction for handling workpieces (22), in particular vehicle chassis (22), said device comprising

a first module having

a handling line (12) with one or more handling regions (14) for the surface treatment of said workpieces (22);

a guide device (44) along said handling line (12); and

a second module having one or more carriages (20; 40; 60) to which said workpieces (22) may be fixed and which may be moved along said guide device (44);  
wherein

said first module is structured and arranged to cooperate and be combined with various types of said second module ~~may each be combined with said first module.~~

2. (Currently Amended) A device according to claim 1,  
~~characterized in that~~ wherein said guide device (44) is disposed on one side of said handling line (12) only.

3. (Currently Amended) A device according to claim 2,  
~~characterized in that~~ wherein said guide device comprises at least one rail (44).

4. (Currently Amended) A device according to claim 3,  
~~characterized in that~~ wherein said carriages (20; 40; 60) have rollers (30) that roll on said at least one rail (44) of said guide device.

5. (Currently Amended) A device according to claim 1, ~~characterized in that~~ wherein said first module further comprises

a first transfer station (18) that interacts with a first conveying means for supplying said workpieces (22) to be handled; and

a second transfer station (18) that interacts with a second conveying means (46) for removing said handled workpieces (22).

6. (Currently Amended) A device according to claim 5,

~~characterized in that~~ wherein said first module further comprises

a return means~~[[.]] preferably in the form of a conveyor belt (70) or chain conveyor[[.]]~~ for conveying said carriages from said second transfer station (18) to said first transfer station (18).

7. (Currently Amended) A device according to claim 6,

~~characterized in that~~ wherein said return means (70) has a switching means for transferring carriages into or out of a maintenance zone.

8. (Currently Amended) A device according to claim 5,

~~characterized in that~~ wherein said carriages (20; 40; 60) in said second transfer station (18) are pivoted through an angle of approx. 90° around a pivoting shaft (68) in the region of said guide device (44), and said carriages in said first transfer station (18) are pivoted back through the same angle in the opposite direction.

9. (Currently Amended) A device according to claim 8,

~~characterized in that~~ wherein said pivoting shaft (68) is disposed essentially parallel to said guide device (44) and on that side of said guide device (44) which faces away from said one or more handling regions (14).

10. (Currently Amended) A device according to claim 1,

~~characterized in that~~ wherein said carriages (20; 40; 60) and said guide device (40) are designed such that during the handling of said workpieces (22), all the bearings are at any time disposed outside said one or more handling regions (14).

11. (Currently Amended) A device according to claim 5,

~~characterized in that~~ wherein said carriages (20; 40; 60) comprise an outer frame (26); and an inner frame (28) that revolves around a rotary shaft (32) relative to said outer frame, whereby said workpieces (22) may be fixed to said inner frame (28); wherein said rotary shaft (32) of each carriage is disposed in an essentially horizontal and perpendicular manner in relation to the direction of movement of said carriages (20; 40; 60) along said handling line (12).

12. (Currently Amended) A device according to claim ~~12~~ 11, further comprising a means for lifting and/or inclining said rotary shaft (32) relative to said outer frame.

13. (Withdrawn) A device according to claim 11, ~~characterized in that~~ wherein said carriages (20; 40) may be coupled together in the region of said first transfer station (18) and may be detached from one another in the region of said second transfer station (18).

14. (Withdrawn) A device according to claim 13,

~~characterized in that~~ wherein said outer frames (26) have front coupling members (50a) and rear coupling members (50b) that are designed such that rear coupling member (50b) of each carriage (20; 40) may form a detachable form-locked connection with said front coupling member (50a) of a following carriage (20; 40).

15. (Withdrawn) A device according to claim 13,

~~characterized in that~~ wherein said carriages (20; 40) have a connecting means, preferably a hooked-shaped projection, disposed in the region of said outer frame, for a pulling means (52).

16. (Withdrawn) A device according to claim 15,

~~characterized in that~~ wherein said pulling means (52) is disposed in the region of said second transfer station (18) or a pushing means is disposed in the region of said first transfer station, said means being designed to form a detachable connection with said connecting means (36) of that carriage (20; 40) which is located nearest to said second transfer station (18) in the region of said handling line (12), whereby said carriage may be forcibly guided by said pulling means (52) toward said second transfer station (18) or the plurality of carriages that are coupled together may be forcibly guided by said pushing means in the direction of said transfer station.

17. (Withdrawn) A device according to claim 11,

~~characterized in that~~ wherein said second module further comprises

a control means (48; 48a; 48b) in the region of said guide device (44) that interacts with said carriages (20) such as to control a relative rotational movement between an outer frame (26) and an inner frame (28) around said rotary shaft (32).

18. (Withdrawn) A device according to claim 17,

~~characterized in that~~ wherein said control means comprises a guide rail (48) having inclined guide portions (48a, 48b), said guide rail interacting with a lever assembly (38) connected in a rotationally rigid manner to said inner frame (28).

19. (Previously Presented) A device ~~according to claim 11~~ for modular construction for handling workpieces (22), in particular vehicle chassis (22), said device comprising

a first module having

a handling line (12) with one or more handling regions (14) for the surface treatment of said workpieces (22);

a guide device (44) along said handling line (12);

a second module having one or more carriages (20; 40; 60) to which said workpieces (22) may be fixed and which may be moved along said guide device (44);  
wherein

various types of second module may each be combined with said first module, said first module further comprises

a first transfer station (18) that interacts with a first conveying means for supplying said workpieces (22) to be handled; and

a second transfer station (18) that interacts with a second conveying means (46) for removing said handled workpieces (22).

said carriages (20; 40; 60) comprise

an outer frame (26); and

an inner frame (28) that revolves around a rotary shaft (32) relative to said outer frame, whereby said workpieces (22) may be fixed to said inner frame (28);

said rotary shaft (32) of each carriage being disposed in an essentially horizontal and perpendicular manner in relation to the direction of movement of said carriages (20; 40; 60) along said handling line (12), and

further comprising a rotary drive (42) on each carriage, said rotary drive being connected at the output side in a rotationally rigid manner to said inner frame (28) of said carriages (40; 60).

20. (Currently Amended) A device ~~according to claim 11, characterized in that said carriages (60) comprise~~ for modular construction for handling workpieces (22), in particular vehicle chassis (22), said device comprising

a first module having

a handling line (12) with one or more handling regions (14) for the surface treatment of said workpieces (22);

a guide device (44) along said handling line (12);

a second module having one or more carriages (20; 40; 60) to which said workpieces (22) may be fixed and which may be moved along said guide device (44);

wherein

various types of second module may each be combined with said first module, said first module further comprises

a first transfer station (18) that interacts with a first conveying means for supplying said workpieces (22) to be handled; and

a second transfer station (18) that interacts with a second conveying means (46) for removing said handled workpieces (22).

said carriages (20; 40; 60) comprise

an outer frame (26);

an inner frame (28) that revolves around a rotary shaft (32) relative to said outer frame, whereby said workpieces (22) may be fixed to said inner frame (28);

said rotary shaft (32) of each carriage being disposed in an essentially horizontal and perpendicular manner in relation to the direction of movement of said carriages (20; 40; 60) along said handling line (12);

a travel drive (64) for the translatory movement of said carriages (60) along said handling line (12); and

a rotary drive (42) for the rotational movement of said inner frame (28) relative to said outer frame (26);

the translatory movement being independent of the rotational movement.

21. (Currently Amended) A device according to claim 19,

~~characterized in that~~ wherein the transfer of information and/or power from said first

module to said carriages is effected contactlessly, particularly inductively.

22. (Withdrawn) A method for handling workpieces, in particular vehicle chassis, in a device according to claim 1 and having the handling line with one or more of the handling regions for the surface treatment of said workpieces, wherein said workpieces are fixed to the carriages that are moved along said handling line, said method comprising the steps of

initially transporting a workpiece by way of a first conveying means to a first transfer station;

pivoting a carriage up around a pivoting shaft until said carriage holds said workpiece;

passing through said handling line as far as a second transfer station while performing an additional, sectional rotational movement for introducing said workpiece into, or removing it from, one or more handling regions;

pivoting said carriage down around said pivoting shaft in the region of said second transfer station; and at the same time

removing said workpiece by way of a second conveying means;

transporting said carriages that have been pivoted through approx. 90° out of the horizontal plane back to said first transfer station.

23. (Withdrawn) A method according to claim 22,

~~characterized in that~~ wherein said carriages in said second transfer station are pivoted through an angle of approx. 90° around a pivoting shaft in the region of said guide



device and said carriages in said first transfer station are pivoted back through the same angle in the opposite direction.

24. (Withdrawn) A method according to claim 23,

~~characterized in that~~ wherein said pivoting shaft is disposed essentially parallel to said guide device and on that side of said guide device which faces away from said one or more handling regions.

25. (Withdrawn) A method according to claim 22,

~~characterized in that~~ wherein said workpieces are vehicle chassis that are dipped into treatment baths, whereby when they are dipped into a treatment bath, said vehicle chassis are rotated through 180° around a rotary shaft disposed in an essentially horizontal and perpendicular manner in relation to the direction of movement along said handling line, said vehicle chassis pass through said treatment bath in this position and are again rotated through 180° around said rotary shaft when they are removed from said treatment bath.

26. (Withdrawn) A method according to claim 25,

~~characterized in that~~ wherein said vehicle chassis additionally execute a reciprocating movement when they pass through said treatment baths.

27. (Withdrawn) A method according to claim 25,

~~characterized in that~~ wherein said vehicle chassis are coupled together in the region of said handling line in that a carriage pivoted up in the region of said first transfer station is connected in a form-locked manner with the adjacent carriage located in the region of said handling line, and the form-locked connection disengages again when said adjacent carriage is pivoted down in the region of said second transfer station.

28. (Withdrawn) A method according to claim 22,  
~~characterized in that~~ wherein the transportation speed of said carriages is higher during return travel than the average speed of said carriages in the region of said handling line.

29. (Withdrawn) A method according to claim 22,  
~~characterized in that~~ wherein the rotational movement of said carriages is coupled to the translatory movement thereof.

30. (Withdrawn) A method according to claim 22,  
~~characterized in that~~ wherein the rotational movement of said carriages is independent of the translatory movement thereof.

31. (Withdrawn) A method according to claim 30,  
~~characterized in that~~ wherein said carriages in the region of said handling line are moved independently of one another in the translational direction.

32. (Withdrawn) A method according to claim 22,  
further comprising the production of a detachable connection between a pulling means or drive means and a connecting means of that carriage which is located nearest to said second transfer station in the region of said handling line, said carriage being pulled by said pulling means or drive means toward said second transfer station.

33. (Withdrawn) A method according to claim 22,  
further comprising the production of a connection between a pushing means and a plurality of carriages that are connected together, and the pushing of said carriages that are connected together in the direction of said second transfer station.

34.(New) A device according to claim 6, wherein said return means are in the form of a conveyor belt (70) or chain conveyor.

35.(New) A device according to claim 1, wherein said second module comprises at least one first type (20) of carriage not having a drive motor and being forcibly guided along said handling line (12) by said device (10), and

at least one second type (40, 60) of carriage having a drive (64, 42) for moving said second type (40, 60) of carriage along said handling line (12) and/or rotating said second type (40, 60) of carriage at one or more of said respective handling regions (14).

36.(New) A device according to claim 35, wherein said at least one second type (40, 60) of carriage comprises

at least one carriage having a drive (64) for moving said respective carriage along said handling line (12) and being forcibly rotated at said one or more handling regions (14),

at least one carriage (40) having a drive (42) for rotating said respective carriage (40) at said one or more handling regions (14) and being forcibly guided along said handling line (12), and

at least one carriage (60) having a drive (64, 42) for both moving said respective carriage along said handling line (12) and rotating said respective carriage at said one or more handling regions (14).

37.(New) A device according to claim 1, wherein said carriages (20; 40; 60) are structured and arranged to move along said guide device (44) with each said carriage (20; 40; 60) supporting an individual workpiece (22).

and

said second module is structured and arranged such that said one or more carriages (20; 40; 60) pivot about an axis (68) extending substantially parallel to a direction of movement (C) of the workpieces (22) along the handling line (12).

38.(New) A device according to claim 37, wherein said second module is structured and arranged such that said carriages (20; 40; 60) additionally pivot about an axis (32) extending substantially perpendicular to the direction of movement (C) of the workpieces (22) along the handling line (12).

39. (New) A device according to claim 38, wherein said second module is structured and arranged such that said one or more carriages (20; 40; 60) pivot approximately 90° about said axis (68) extending substantially parallel to the direction of movement (C) of the workpieces (22) along the handling line (12).

40.(New) A device according to claim 37, wherein said axis (68) is positioned to one side of said handling line (12) and regions (14) extending substantially parallel to the direction of movement (C) of the workpieces (22) along the handling line (12).